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Contribution of High-Yield Varieties Seeds to Major Food Crops Production, Yield and Area in Punjab – Pakistan

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ABSTRACT

The present study is undertaken to measure the contribution of HYVs to major food crops (Wheat, rice, bajra, jowar and maize) production, yield and area in Pakistan Punjab. The study is based on secondary data for the last 44 years, i.e., from 1951-52 to 1994-95. For this purpose, a comparison of growth rates for production, yield and area is made (1) between period I (1951 to 1964) and period II 1965 to 1978). (2) between period II and period III (1979 to 1994) and (3) between period I and period IV (1951 to 1994). The study shows that the influence of HYV seed on production, yield and area for major food crops in Punjab is mixed. The contribution of HYVs to production, area and yield growth for wheat is remarkable. The adoption of HYVs has helped to accelerate the growth rate for production and yield for rice and maize in period II. In case of Jowar despite the fact that its area and production decreased its yield increased in period II, which may be due to the adoption of HYV seeds.

JEL. Classification: Q12; O13

Keywords: Growth, Comparison, Periods, Time-series, Semi-log, HYV seed, Food crops, Area, Yield.

1. INTRODUCTION

Food crops occupy an important position in Pakistan economy as they account for 68 percent of the gross cropped area (94-95). Punjab accounted for 45 percent (93-94) of the Pakistan acreage of food crops. Wheat undisputedly enjoys a pre-eminent status in the food crops profile of Punjab as it is cultivated in over 5902 thousand hectares and accounts for about 84 percent of production. Rice which comes after wheat occupies over 1339 thousand hectares and accounts for over 11 percent of food crops production. Maize which is the third major food crop in Punjab and comes after wheat and rice occupies over 345 thousand hectares and accounts for over 3 percent of food crops production. Bajra and Jowar which occupies over 303 and 253 thousand hectares respectively, accounts for less than 1 percent of food crops output.

Several micro level studies in India have substantiated the yield-raising characteristics of new seed varieties (HYVs)[1]. They suggest that production per unit of Land is higher on the farms which apply HYVs than on those which apply traditional seed varieties. At the same time, some of these studies have also indicated that the yield potential of HYVs has not yet been

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[1] Acharya (1969), Gopalakrishnan (1968), Gohain (1968), Lavania and Dixit (1968), Parthasarathy (1971).

fully exploited because of the gap between the recommended and the actual application of certain crucial inputs. Wide variations in the extent of adoption across different farm sizes are also highlighted by few of these studies.

Studies are also conducted at the macro level to examine the impact of HYVs on yield, production and area level. These studies attempted to measure the magnitude of change in terms of growth rate of yield with the advent of HYVs. Based on time-series data, these studies[2] tried to test the hypothesis that the growth rate of yield will be higher for the period after its introduction. These studies have shown that considerable improvement has been recorded only in respect of wheat production. "On the whole, the effects of the green revolution on production and yield of food crops have been mixed, spectacular for wheat, some improvement for bajra and maize and no improvement for jowar and rice. In sum, the extent of green revolution in India has been small; both in terms of area covered and impact on production. The future scope is also very limited". At the macro level thus the yield-raising characteristics of HYVs have not been realized fully.

In Pakistan no attempts have been made to estimate the contribution of HYVs to major food crops yield, production and area. The present study is, therefore, undertaken to measure the contribution of HYVs to major food crops production, yield and area in Punjab. The major food crops are wheat, rice, bajra, jowar and maize.

Specific objectives of the study are: to quantify the rate of the growth, to estimate the level of variability and to discuss policy implications of observed growth rate and variability in crops area, production and productivity of major crops.

This paper is structured in the following way: in section 2, data and methodology is given. In section 3, growth rates in food crops production of three periods is discussed. Section 4 is about comparison of three periods and finally section 5 concludes and gives implications.

2. DATA AND METHODOLOGY

The study is based on secondary data for the last 44 years, i.e., from 1951-52 to 1994-95. For this purpose, a comparison of growth rates for production, yield and area of the above mentioned crops is made (1) between period I (1951 to 1964) and period II (1965 to 1978). (2) between period II and period III (1979 to 1994) and (3) between period I and period IV (1951 to 1994). The data relating to area, production and yield of major food crops of Punjab were obtained from the Agricultural statistics of Pakistan, Ministry of Food, Agriculture, and Livestock, Government of Pakistan. While doing this exercise, it is assumed that the growth rates of fertilizer use, irrigated area and cropping intensity are likely to contribute to the growth of production per acre in the same way as in pre-technology (HYV) period.

The compound growth rates of production, yield and area of major food crops were worked out by semilog exponential form.

[2] Srinivasan (1972), Sen (1974), Patel (1975), Patel and Pathak (1974), Keith Griffin (1974), Singh (1976), Sinha (1973).

$\text{Log } Y_t = a + b_t$ where,

Y= prodtion/acrage of major food crops

a= constant

b=expresses the rate of change and when multiplied by 100 gives the percentage growth rate

t= time variable in year (1, 2,…….,n)

2. GROWTH RATES IN FOOD CROPS PRODUCTION

2.1 Period-I (1951 to 1964): At the time of independence, the food supply situation was not comfortable and the country had to import sizable quantities of food grains to augment the domestic availability. By the end of the fifties, however, pressing problems like food shortage, foreign exchange scarcity, and raw material constraints on industrial development were responsible for forcing the planners towards an agricultural policy. This policy aimed at achieving self-sufficiency in food, by increasing production for both domestic use and export, and by reducing unemployment and underemployment and restructuring land relationships.

2.2 Period-II (1965 to 1978): The change was emphasis in government policy, which was initiated in the early sixties, coincided with the advent of so-called "green revolution". This revolution started with scientific and technological breakthroughs in the form of inputs. During 1965-69, high yielding varieties of seeds, fertilizers, pesticides, farm mechanization and continued increases of supplementary water contributed to the agricultural breakthrough.

2.3 Period-III (1979 to 1994): In this period the agricultural progress slowed down. Despite a greater availability of key inputs like fertilizers, high yielding varieties of seeds and water, the agricultural sector began to experience diminishing returns, since enough attention had not been paid to the efficiency of their use. Thus, despite land reforms which were introduced in the early seventies, the institutional failure to supplement the key inputs proved crucial in slowing down the agricultural growth.

3. COMPARISION

3.1 Comparison Between Period I and II: as shown in Table-1, between period I and II, while the growth of production of bajra and jowar decelerated from 0.71 and 0.42 percent to -1.66 and 0.27 percent per annum respectively, that of wheat, rice and maize accelerated from 3.23, 6.19 and 2.72 percent to 5.18, 6.70 and 2.95 percent per annum respectively. In the case of wheat, rice and maize acceleration in the growth of production came through the improvement in yield. In case of jowar the deceleration in the growth of production occurred through the deceleration in the growth of area, while deceleration in bajra came through the deceleration in the growth of both area and yield per hectare. While the growth of yield per hectare of wheat, rice, jowar and maize accelerated from 1.47, 0.79, 0.45 and 0.87 percent to 3.95, 2.52, 1.53 and 1.97 percent per annum respectively, the growth of yield per hectare of bajra decelerated from 2.21 to 0.74 percent per annum. The be

growth of area per hectare of wheat, rice, bajra, jowar and maize decelerated from 1.76, 5.39, -1.49, -0.03 and 1.85 percent to 1.23, 4.17, -2.41, -1.25 and 0.97 percent per annum respectively. The main conclusion that emerges from this section is that the production growth rates in period II are higher than those in period I for wheat, rice and maize, which may partly attributed to the adoption of HYV seeds.

3.2 Comparison between Period II and III*:* As shown in table-1, between period ii and iii, while the growth of production of wheat, rice, bajra and maize decelerated from 5.18, 6.70, -1.66 and 2.95 to 3.09, 0.34, -2.58 and -0.01 percent per annum respectively, that of jowar accelerated from 0.27 to 0.90 percent per annum. In case of wheat, rice and maize the deceleration in the growth of production occurred through the deceleration in the growth of both area and yield per hectare, while in case of bajra the deceleration in the growth of production occurred through the deceleration in the growth of yield only. In case of jowar the acceleration in the growth of production occurred through the acceleration in the growth of area only. The growth of yield of wheat, rice, bajra, jowar and maize decelerated from 3.95, 2.52, 0.74, 1.53 and 1.97 to 1.93, -0.95, -1.93, -0.10 and 1.97 percent per annum respectively. In case of wheat, rice and maize the deceleration in the growth of yield occurred through the deceleration in the growth of both area and yield per hectare, while in case of bajra the deceleration in the growth of yield occurred through the deceleration in the growth of production only. As far as jowar is concerned its yield decelerated in spite of the acceleration in area and production. This decrease in yield may be due to pest attack or flood or both. While the growth of area of wheat, rice and maize decelerated from 1.23, 4.17 and 0.97 to 1.16, 1.29 and -0.09 percent per annum respectively, that of bajra and jowar accelerated from -2.41 and -1.25 to -0.66 and 1.01 percent per annum respectively. In the case of wheat, rice and maize deceleration in the growth of area came through the deceleration in the growth of both production and yield. The acceleration in the growth of bajra area is due to the acceleration in its production only. The main conclusion that emerges from this section is that the yield growth rates in period III are lower than those in period II for wheat, rice, bajra and maize which is mainly due to decrease in production.

3.3 Comparison between Period II and III**:** A comparison between the yield growth rates of period I and period IV reveals that the yield growth rates of wheat, rice, jowar and maize have improved for the latter period which may partly be attributed to the adoption of HYV seeds.

Table I
Compound Growth Rates of Area, Production and Yield of Major Food Crops in Punjab
(percent per annum)

Crops	Period	Area	Productio	Yield

			n	
Wheat	(I) 1951 to 1964	1.76 (5.76)*	3.23 (4.71)*	1.47 (2.71)**
	(II) 1965 to 1978	1.23 (3.78)*	5.18 (5.94)*	3.95 (6.40)*
	(III) 1979 to 1994	1.16 (12.16)*	3.09 (7.79)*	1.93 (4.73)*
	(IV) 1951 to 1994	1.58 (32.35)*	4.17 (31.98)*	2.59 (23.81)*
Rice	(I) 1951 to 1964	5.39 (13.30)*	6.19 (7.14)*	0.79 (1.12)
	(II) 1965 to 1978	4.17 (5.51)*	6.70 (7.06)*	2.52 (4.60)*
	(III) 1979 to 1994	1.29 (5.39)*	0.34 (0.97)	-0.95 (3.29)*
	(IV) 1951 to 1994	3.37 (24.06)*	4.41 (15.51)*	1.02 (5.61)*
Bajra	(I) 1951 to 1964	-1.49 (2.47)**	0.71 (0.76)	2.21 (4.49)*
	(II) 1965 to 1978	-2.41 (7.07)*	-1.66 (4.09)*	0.74 (3.21)*
	(III) 1979 to 1994	-0.66 (1.87)***	-2.58 (5.63)*	-1.93 (4.68)*
	(IV) 1951 to 1994	-1.87 (16.29)*	-1.58 (9.09)*	0.29 (2.28)**
Jowar	(I) 1951 to 1964	-0.03 (0.07)	0.42 (0.42)	0.45 (0.63)
	(II) 1965 to 1978	-1.25 (2.70)**	0.27 (0.49)	1.53 (3.62)*
	(III) 1979 to 1994	1.01 (2.51)**	0.90 (1.93)***	-0.10 (0.57)
	(IV) 1951 to 1994	-0.32 (3.03)*	0.38 (3.00)*	0.70 (7.24)*
Maize	(I) 1951 to 1964	1.85 (5.11)*	2.72 (4.21)*	0.87 (1.80)***
	(II) 1965 to 1978	0.97 (2.29)**	2.95 (3.62)*	1.97 (3.75)*
	(III) 1979 to 1994	-0.09 (0.48)	-0.01 (0.02)	0.08 (0.44)
	(IV) 1951 to 1994	1.37 (16.82)*	2.35 (16.34)*	0.98 (10.99)*

Note: *, **, *** Significant at 1,5 and 10 percent level respectively. Figures in parenthesis are t-values.

4. CONCLUSION AND POLICY IMPLICATIONS

It emerges from this exercise that the influence of HYV seed on production, yield and area for major food crops in Punjab is mixed. The contribution of HYVs to production, yield and area growth for wheat is remarkable. The adoption of HYVs has helped to accelerate the growth rate for production and yield for rice and maize in period II. In case of Jowar despite the fact that its area and production decreased its yield increased in period II, which may be due to the adoption of HYV seeds.

In order to improve the growth rate of area, production and yield, the following steps are necessary:

(1) The information on production technology should be popularized through mass-media like regional newspaper, radio, Television and leaflets, bulletins, booklets, etc. (2) New thrust on research must be in the direction of evolving high-yield-cum high stability varieties suitable for rain-fed as well as irrigated area (3) All out efforts are required to improve the management practices and input use in respect of the crops (4) Critical inputs should be made available in time and in assured quantities (5) Mixed cropping should be encouraged (6) Adequate credit facilities should also be provided to the farmers (7) Training programmes should be organized on a large scale in the villages on production technology and use of agricultural implements (8) Cultivation should be extended to the areas of marginal productivity (9) Extension services should be made available to the farming community.

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